

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Amendment of the Commission's Rules to Promote Aviation Safety)	WT Docket No. 19-140
)	
WiMAX Forum Petition to Adopt Service Rules for the Aeronautical Mobile Airport Communications System (AeroMACS))	RM-11793
)	
Petition of Sierra Nevada Corporation for Amendment of the Commission's Rules to Allow for Enhanced Flight Vision System Radar under Part 87)	RM-11799
)	
Petition of Aviation Spectrum Resources, Inc. for Amendment of Sections 87.173(b) and 87.263(a) of the FCC's Rules to Allow Use of the Lower 136 MHz Band by Aeronautical Enroute Stations)	RM-11818
)	
Petition of Airports Council International-North America Regarding Aeronautical Utility Mobile Stations)	RM-11832
)	

COMMENTS OF SIERRA NEVADA CORPORATION

Sierra Nevada Corporation ("SNC") submits these comments in response to the above-captioned Notice of Proposed Rulemaking ("NPRM"), which proposes numerous changes to the Federal Communications Commission's ("FCC" or "Commission") rules for the Part 87 Aviation Radio Service.^{1/} SNC supports the Commission's proposals relating to the establishment of rules for 90 GHz Enhanced Flight Vision Systems ("EFVS") radar, which it should adopt without delay.

^{1/} *Amendment of the Commission's Rules to Promote Aviation Safety; WiMAX Forum Petition to Adopt Service Rules for the Aeronautical Mobile Airport Communications System (AeroMACS); Petition of Sierra Nevada Corporation for Amendment of the Commission's Rules to Allow for Enhanced Flight Vision System Radar under Part 87; Petition of Aviation Spectrum Resources, Inc. for Amendment of*

I. BACKGROUND

Sierra Nevada Corporation, established in 1963 and headquartered in Sparks, Nevada, is a privately owned and operated company focused on aerospace, aviation, systems integration, and electronics. SNC has numerous fielded systems operating throughout the world by both private and public entities, and is developing the Dream Chaser spaceplane to deliver cargo to the International Space Station.

For nearly a decade, SNC has been developing a radar-based EFVS that would allow for landings of fixed and rotary wing aircraft during Degraded Visual Environments (“DVEs”), such as brownouts, sandstorms, snowstorms, and other poor visibility conditions.^{2/} On February 16, 2018, SNC filed a Petition for Rulemaking (“SNC Petition”) requesting that the Commission modify Part 87 of its rules to allow EFVS radar operations in the 92-95.5 GHz frequency range, a request no party opposed.^{3/} As detailed below, permitting 90 GHz radar for EFVS will allow for numerous public benefits with an exceedingly limited possibility of harm.

II. THE COMMISSION SHOULD ADOPT ITS PROPOSED RULES ENABLING THE OPERATION OF ENHANCED FLIGHT VISION SYSTEMS

In the NPRM, the Commission issued proposed rules for EFVS radar in response to SNC’s unopposed Petition for Rulemaking.^{4/} The Commission correctly concluded that it would be in the

Sections 87.173(b) and 87.263(a) of the FCC’s Rules to Allow Use of the Lower 136 MHz Band by Aeronautical Enroute Stations; Petition of Airports Council International-North America Regarding Aeronautical Utility Mobile Stations, Notice of Proposed Rulemaking, FCC 19-53 (rel. June 7, 2019) (“NPRM”).

^{2/} SNC has been testing this system under FCC experimental authority.

^{3/} *Amendment of the Commission’s Rules to Allow for Enhanced Flight Vision System Radar under Part 87*, Petition of Sierra Nevada Corporation for Rulemaking, Docket No. RM-11799 (filed Feb. 16, 2018) (“SNC Petition”).

^{4/} NPRM at ¶ 9.

public interest to provide for EFVS radar in the 90 GHz band, and that it should adopt the rules for EFVS as proposed. SNC supports the Commission’s tentative conclusions and urges it to adopt the rule changes necessary to permit EFVS radar operations.

a. Public Interest

In the NPRM, the Commission tentatively concluded that accommodating the effective and efficient use of EFVS radar is in the public interest.^{5/} SNC agrees with the Commission’s conclusion that allowing the operation of EFVS radar will provide significant public benefit, including more efficient flight and airport operations. EFVS using mmWave radar achieves these results by enhancing a pilot’s natural vision during poor visibility conditions such as brownouts, sandstorms, snowstorms, or fog, aiding in creating a computer-generated image of terrain and obstacles otherwise invisible to the naked eye. There is no technology on the market today that can enable aircraft landings in moderate to severe Degraded Visual Environments (“DVEs”).^{6/}

EFVS also can ameliorate the environmental impact of air travel by reducing the amount of aircraft fuel needed to safely land or reroute aircraft. Although not all weather delays are due to low visibility, many are: Weather delays accounted for more than 35% of all delays nationwide during last year’s winter months.^{7/} Interrupted flights caused by low visibility conditions can force aircraft to re-route or remain airborne, costing passengers lost time and airlines additional fuel.^{8/} EFVS with mmWave radar can “increase access, efficiency and

^{5/} NPRM at ¶ 10.

^{6/} SNC Petition at 2.

^{7/} Federal Aviation Administration, *Weather's Share of Delayed Flights National (December, 2018-May, 2019)*, https://www.transtats.bts.gov/OT_Delay/ot_delaycause1.asp?type=3&pn=1 (last visited July 19, 2019).

^{8/} See Federal Aviation Administration, *Revisions to Operational Requirements for the Use of Enhanced Flight Vision Systems (EFVS) and to Pilot Compartment View Requirements for Vision Systems*, Notice of Proposed Rulemaking, 78 Fed. Reg. 34935, 34949 (June 11, 2013).

throughput in low visibility conditions, and minimize potential for missed approaches and delayed take-offs.”^{9/} EFVS can dramatically decrease the amount of time an aircraft spends in a holding pattern waiting for visibility conditions to improve.

Adoption of the proposed rule changes enabling EFVS radar also will promote implementation of the FAA’s NextGen Implementation Plan (“NextGen Plan”). In addition to improving operations at airports generally, the NextGen Plan makes it a specific goal to improve approaches and low-visibility operations, including capabilities designed to increase airport approach, arrival access, and flexibility.^{10/} While current infrared-based technologies are insufficient to support landings in heavily degraded conditions, EFVS using 90 GHz radar will significantly improve aircraft access to airports, particularly those susceptible to frequent foggy or rainy conditions. Moreover, EFVS radar can fit onto the nose of most aircraft and requires no ground systems, enabling airports to eliminate much of the costly ground infrastructure used for landings and approaches. This may open airports that are presently limited from certain operations because they do not have appropriate ground systems in place.

b. Coexistence

The Commission seeks comment on the ability of EFVS radar to co-exist successfully with other users in the band, and whether EFVS radars are compatible with existing and contemplated services in the 92-95.5 GHz band.^{11/} No parties responded to the public notice seeking comment on SNC’s Petition for Rulemaking indicating that this would be a concern. Shortly before the issuance of the NPRM, however, one party filed a letter regarding the

^{9/} *Id.*

^{10/} Federal Aviation Administration, *NextGen Implementation Plan 2016*, at 38-41 (2016), https://www.faa.gov/nextgen/media/NextGen_Implementation_Plan-2016.pdf.

^{11/} *NPRM* at ¶¶ 10, 12.

compatibility of EFVS radar with the potential use of Foreign Object Debris (“FOD”) radar systems operating in the same band.^{12/}

Several factors combine to make the probability of an EFVS system causing harmful interference extremely unlikely. As Sierra Nevada explained in its previous filings, its EFVS radar uses low power, operates at low altitude and with short duration, and has a low duty cycle.^{13/} In addition, EFVS will operate only under adverse conditions – which will increase the already severe propagation losses that occur in the 90 GHz frequency range – and will generally be operational for less than thirty seconds over the course of less than a linear mile prior to an aircraft touching down.^{14/}

There are currently few users in the 90 GHz band. Most of the 92-95 GHz band is allocated to non-Federal and Federal users on a co-primary basis, though 94-94.1 GHz is allocated to Federal use on a primary basis.^{15/} While some Fixed Service (“FS”) links have been coordinated, no commercial equipment appears to be available.^{16/} Even if equipment were to

^{12/} *Letter from Paul Revell, Managing Director, Moog Fernau Limited, to Marlene Dortch, Secretary, Federal Communications Commission, Re: Written ex parte presentation: Amendment of the Commission’s Rules to Promote Aviation Safety, WT Docket No. 19-140; Petition of Sierra Nevada Corporation for Amendment of the Commission’s Rules to Allow for Enhanced Flight Vision Radar under Part 87, RM-11799 (filed May 28, 2019).*

^{13/} *SNC Petition* at 13.

^{14/} *SNC Petition* at 9.

^{15/} 47 C.F.R. § 2.106.

^{16/} A search of the FCC’s equipment authorization database, conducted on July 19, 2019, indicated that only one grant of certification has been issued for the 90 GHz band, for a Part 15 device. In this band, Part 15 users are limited to indoor operations, their signals must not be intentionally directed outside of buildings, and they are not permitted on aircraft or satellites. 47 C.F.R. § 15.257(a). EFVS radar will not disrupt unlicensed devices operating in the band.

become available, the risk of interference from EFVS radar into microwave links would be extremely low for the reasons explained above.^{17/}

SNC is also confident that it can safely share the spectrum with Federal users. SNC recognizes that footnote US342 applies to most of the bands in the 92-100 GHz range, and provides that “all practical steps shall be taken to protect the radio astronomy service from harmful interference.”^{18/} Earth exploration satellite service (“EESS”) and space research operations in this frequency range are limited to CloudSat, which projects a relatively small beam footprint, resulting in a very low probability of intersection with the EFVS transmissions.^{19/}

In terms of compatibility with FOD radar systems, SNC is supportive of the research engaged in by the WRC-19 Working Party 5G to consider a proposal to authorize FOD detection systems in the 92-100 GHz band. SNC does not anticipate that EFVS radar will prove incompatible with foreign object debris detection systems, and will work constructively to develop an effective spectrum sharing plan should one prove necessary. It appears from preliminary discussions that there is sufficient bandwidth so that channel selection may facilitate effective sharing between EFVS and FOD systems operating at the same facilities. In any event,

^{17/} In addition to the characteristics of EFVS that make interference unlikely, FS antennas are very high gain, meaning they are set in very targeted and precise directions, and are intended to be set horizontally, while EFVS radars will be directed along a 3% grade on fast-moving aircraft.

^{18/} 47 C.F.R. § 2.106 n.US342. In this band, RAS is used at three locations in the country: Kitts Peak, AZ, Owens Valley, CA, and – weather permitting – Green Bank, WV.

^{19/} 47 C.F.R. § 2.106 n.5.562. SNC has suggested that all FCC-certified EFVS radars meet the same technical standards as federal radars (*i.e.*, Radar Spectrum Engineering Criteria standards in Chapter 5 of the NTIA’s Redbook), which were adopted to ensure the safe sharing of multiple compliant devices in this spectrum range.

the Commission should not prematurely foreclose the operation of 90 GHz EFVS radar, which clearly is in the public interest, in favor of potential uses that may never come to fruition.^{20/}

c. Proposed Rule Changes

Finally, the Commission seeks comment on its specific proposals to amend its rules to permit the use of the 92-95.5 GHz band for EFVS radar, including any associated costs and benefits.^{21/} These changes would include amending the Table of Allocations to add a Radionavigation Service allocation to the 92-95 GHz band. They also include amending Part 87 by adding service rules listing the 92-95.5 GHz band as an authorized band for EFVS radar; defining Enhanced Flight Vision System; and exempting EFVS systems from the station identification requirement in Section 87.107. These changes are necessary to enable the operation of EFVS systems, and SNC supports all of these proposed modifications to the Commission's rules. Importantly, adopting the proposal to apply Section 87.147 to the approval of EFVS radar will allow both the FCC and the FAA to evaluate any proposed EFVS radar on a case-by-case basis.^{22/} This will maintain technical neutrality and flexibility in the new rules.

The cost-benefit analysis is clearly in favor of approving these rule changes. Given the high potential for cooperative existence of many types of devices in the band, the proposed rule change can provide public benefit at little to no cost. EFVS 90 GHz radar has been tested and proven to be highly effective. Allowing its use on this otherwise sparsely used spectrum band will create measurable benefits including more efficient and timely flight and airport operations,

^{20/} In this vein, SNC recognizes the statement by Commissioner O'Rielly that the Commission will not protect potential uses that have not yet come to fruition. Statement of Commissioner Michael O'Rielly, *NPRM* at Statement of Commissioner Michael O'Rielly. SNC respects the need to make efficient use of the radio spectrum and has no intention of coordinating spectrum use that it does not intend to use.

^{21/} *NPRM* at ¶ 13.

^{22/} 47 C.F.R. § 87.147.

reduced fuel consumption, and a reduction in costly airport infrastructure. Finally, enabling EFVS radar on 90 GHz, where chip and component manufactures have coalesced their designs of standard, “off-the-shelf” chipsets and components,^{23/} will allow for the more economical radar systems.

III. CONCLUSION

The 90 GHz band is uniquely well suited for short-range radar systems that can penetrate degraded visual environments. Chip and parts manufacturers have designed short-range mmWave radar technologies around the 90 GHz band. Given the development of this available equipment and technology, and the FAA’s Next Generation goals, the FCC should adopt its proposed rules to allow EFVS radar in 90 GHz.

Respectfully submitted,

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^{23/} See SNC Petition at 7.